


FORM PTO-1390 REV. 5-93		US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEYS DOCKET NUMBER P00,1957
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/744079
INTERNATIONAL APPLICATION NO. PCT/DE99/01946	INTERNATIONAL FILING DATE 01 JULY 1999	PRIORITY DATE CLAIMED 22 JULY 1998	
TITLE OF INVENTION METHOD FOR SWITCHING DATA RECEIVED VIA A PACKET-ORIENTED DATA TRANSMISSION PATH			
APPLICANT(S) FOR DO/EO/US KLAUS HÜNLICH ET AL.			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay. 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of International Application as filed (35 U.S.C. 371(c)(2)) - drawings attached. a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US) 6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)) - drawings attached. 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3)) a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input checked="" type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). Items 11. to 16. below concern other document(s) or information included: 11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; (PTO 1449, Prior Art, Search Report, 07 References). 12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included. (SEE ATTACHED ENVELOPE) 13. <input checked="" type="checkbox"/> Amendment "A" Prior to Action with attached Appendix "A". <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input checked="" type="checkbox"/> A substitute specification and Mark-Up for Substitute Specification. 15. <input checked="" type="checkbox"/> A change of address letter attached to the Declaration. 16. <input checked="" type="checkbox"/> Other items or information: a. <input checked="" type="checkbox"/> Request for Approval of Drawing Additions b. <input checked="" type="checkbox"/> Appointment of Associate Power of Attorney c. <input checked="" type="checkbox"/> EXPRESS MAIL #EL655302700US dated January 19, 2001.			

U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5)		INTERNATIONAL APPLICATION NO. PCT/DE99/01946		ATTORNEY'S DOCKET NUMBER P00,1957	
17. <input checked="" type="checkbox"/> The following fees are submitted: <div style="margin-top: 10px;"> BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO \$860.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) .. \$690.00 No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2)) \$710.00 Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2)) paid to USPTO \$1000.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$ 100.00 ENTER APPROPRIATE BASIC FEE AMOUNT = </div>				CALCULATIONS	PTO USE ONLY
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).				\$	
Claims	Number Filed	Number Extra	Rate		
Total Claims	07 - 20 =	0	X \$ 18.00	\$	
Independent Claims	01 - 3 =	0	X \$ 80.00	\$	
Multiple Dependent Claims			\$270.00 +	\$	
TOTAL OF ABOVE CALCULATIONS =				\$ 860.00	
Reduction by ½ for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)				\$	
SUBTOTAL =				\$ 860.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$ 860.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). \$40.00 per property				+	
TOTAL FEES ENCLOSED =				\$ 860.00	
				Amount to be refunded	\$
				charged	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>860.00</u> to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>50-1519</u> . A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: SCHIFF HARDIN & WAITE PATENT DEPARTMENT 6600 Sears Tower 233 South Wacker Drive Chicago, Illinois 60606-6473			<div style="text-align: center;">  SIGNATURE </div> <div style="text-align: center;"> Mark Bergner NAME </div> <div style="text-align: center;"> <u>45,877</u> Registration Number </div>		

BOX PCT
IN THE UNITED STATES DESIGNATED/ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY--CHAPTER II

5 APPLICANT(S): KLAUS HÜNLICH ET AL.
ATTORNEY DOCKET NO.: P00,1957
INTERNATIONAL APPLICATION NO: PCT/DE 99/01946
INTERNATIONAL FILING DATE: 01 JULY 1999
INVENTION: METHOD FOR SWITCHING DATA RECEIVED VIA A PACKET-
ORIENTED DATA TRANSMISSION PATH

Assistant Commissioner for Patents,
Washington D.C. 20231

AMENDMENT A PRIOR TO ACTION

Sir:

Applicants herewith amend the above-referenced PCT application, and
15 request entry of the Amendment prior to examination on the United States
Examination Phase.

IN THE CLAIMS:

On substitute page 10:

20 replace line 1 with --WHAT IS CLAIMED IS:--;

Please replace original claims 1- 7 with the following rewritten claims 1-7,
referring to the mark-ups in Appendix A.

25 1. (Amended) A method for switching data that are received via a packet-
oriented data transmission link and are to be forwarded, in which data packets
subdivided into sub-structure elements are established for a data transmission via
said packet-oriented data transmission link, comprising the steps of:

allocating, by a conversion unit, an allocation of said data received via said
packet-oriented data transmission link to channels of a timeslot-oriented data format
30 formed of a periodic sequence of channel-individual information segments, such that

data allocated to a sub-structure element are allocated to at least one channel of said timeslot-oriented data format;

switching said data converted into said timeslot-oriented data format via a timeslot-oriented switching network module;

5 converting said timeslot-oriented data back into said packet-oriented data format; and

transmitting said data converted back into said packet-oriented data format via said packet-oriented data transmission link.

10 2. (Amended) The method according to claim 1, wherein said step of transmitting data via said packet-oriented data transmission link ensues according to the asynchronous transfer mode data format.

15 3. (Amended) The method according to claim 1, further comprising the step of:

reserving a sub-structure element for a transmission of signaling information allocated to data transmitted via said packet-oriented data transmission link.

20 4. (Amended) The method according to claim 3, further comprising the steps of:

receiving signaling information by said conversion unit;

communicating said received signaling information from said conversion unit to a control unit; and

25 converting said signaling information into switching-oriented control data for said timeslot-oriented switching network module.

5. (Amended) The method according to claim 1, further comprising the step of:

30 inserting filler cells for an adaptation of a transmission bit rate deriving due to an arrival and size of sub-structure elements to a transmission bit rate of a channel.

6. (Amended) The method according to claim 1, further comprising the step
of:

inserting filler data into a sub-structure element for an adaptation of a
transmission bit rate deriving due to an arrival and a size of sub-structure elements
to a transmission bit rate of a channel.

7. (Amended) The method according to claim 6, further comprising the step
of:

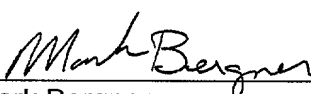
transmitting, for each channel, information about a plurality of payload data
communicated in a channel and information about a plurality of filler data
communicated in said channel.

REMARKS

The present Amendment revises the specification and claims to conform to
United States patent practice, before examination of the present PCT application in
the United States National Examination Phase. Pursuant to 37 CFR 1.125 (b),
applicants have concurrently submitted a substitute specification, excluding the
claims, and provided a marked-up copy. All of the changes are editorial and
applicant believes no new matter is added thereby. The amendment of the claims is
not intended to be a surrender of any of the subject matter of those claims.

Early examination on the merits is respectfully requested.

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Appendix A
Mark Ups for Claims

This redlined draft, generated by CompareRite (TM) - The Instant Redliner, shows the differences between -
original document : Q:\DOCUMENTS\YEAR 2000\P001957-HUENLICH\ORIGINAL CLAIMS.DOC
and revised document: Q:\DOCUMENTS\YEAR 2000\P001957-HUENLICH\AMENDED CLAIMS.DOC

CompareRite found 64 change(s) in the text

Deletions appear as Overstrike text surrounded by []
Additions appear as Bold-Underline text

1. ~~[Method]~~ **(Amended) A method** for switching data that are received via a packet-oriented data transmission link and are to be forwarded, ~~[whereby]~~ **in which** data packets ~~[(ATM-Z1, ATM-Z2)]~~ subdivided into sub-structure elements ~~[(SE)]~~ are established for a data transmission via ~~[the]~~ **said** packet-oriented data transmission link, ~~[characterized in that]~~
]comprising the steps of:

allocating, by a conversion unit, an allocation of ~~[the]~~ **said** data received via ~~[the]~~ **said** packet-oriented data transmission link to channels of a timeslot-oriented data format ~~[TDM]~~ formed of a periodic sequence of channel-individual information segments ~~[is undertaken such by a conversion unit (UE) that the]~~, **such that** data allocated to a sub-structure element ~~[(SE)]~~ are allocated to at least one channel of ~~[the]~~ **said** timeslot-oriented data format~~[(TDM);]~~;

~~[in that a]~~ switching ~~[of the]~~ **said** data converted into ~~[the]~~ **said** timeslot-oriented data format ~~[ensues]~~ via a timeslot-oriented switching network module~~[(KN); and];~~

~~[in that the]~~ **converting said** timeslot-oriented data ~~[are converted]~~ back into ~~[the]~~ **said** packet-oriented data format ~~[and are transmitted via the]; and~~

transmitting said data converted back into said packet-oriented data format via said packet-oriented data transmission link.

2. ~~[Method]~~**(Amended) The method** according to claim 1, ~~[characterized in that a data transmission via the]~~ **wherein said step of transmitting data via said** packet-oriented data transmission link ensues according to the [ATM] **asynchronous transfer mode** data format~~[(asynchronous transfer mode)]~~.

~~[3. Method]~~ **3. (Amended) The method** according to ~~[one of the preceding claims, characterized in that]~~ **claim 1, further comprising the step of:**

reserving a sub-structure element ~~[(SE) is reserved for the]~~ **for a** transmission of signaling information allocated to data transmitted via ~~[the]~~ **said** packet-oriented data transmission link.

4. ~~[Method]~~**(Amended) The method** according to claim 3, ~~[characterized in that the]~~ **further comprising the steps of:**

receiving signaling information by said conversion unit;
communicating said received signaling information ~~[are communicated]~~ from ~~[the]~~ **said** conversion unit ~~[(UE)]~~ to a control unit~~[(STE) wherein the]; and~~
converting said signaling information ~~[are converted]~~ into switching-oriented control data for ~~[the]~~ **said** timeslot-oriented switching network module~~[(KN)]~~.

5. ~~[Method]~~**(Amended) The method** according to ~~[one of the preceding claims, characterized in that]~~ **claim 1, further comprising the step of:**

inserting filler cells ~~[(FZ) are inserted]~~ for an adaptation of ~~[the]~~ **a** transmission bit rate deriving due to ~~[the]~~ **an** arrival and ~~[the]~~ size of sub-structure elements ~~[(SE)]~~ to ~~[the]~~ **a** transmission bit rate of a channel.

6. ~~[Method]~~**(Amended) The method** according to ~~[one of the claims 1 through 4, characterized in that]~~ **claim 1, further comprising the step of:**

inserting filler data ~~[(FD) are inserted]~~ into a sub-structure element ~~[(SE)]~~ for an adaptation of ~~[the]~~ **a** transmission bit rate deriving due to ~~[the]~~ **an** arrival and ~~[the]~~ **a** size of sub-structure elements ~~[(SE)]~~ to ~~[the]~~ **a** transmission bit rate of a channel.

7. ~~[Method]~~**(Amended) The method** according to claim 6, ~~characterized in that an~~ **further comprising the step of:**

transmitting, for each channel, information about ~~[the]~~ **a** plurality of payload data communicated in ~~[the]~~ **a** channel and ~~[an]~~ information about ~~[the]~~ **a** plurality of
5 filler data ~~[(FD)]~~ communicated in ~~[the channel is transmitted for each]~~ **said** channel.

SPECIFICATION

TITLE

METHOD FOR SWITCHING DATA RECEIVED VIA A PACKET-ORIENTED DATA
TRANSMISSION PATH

5

BACKGROUND OF THE INVENTION

Field of the Invention

1 The invention is directed to a method for switching data that are received via a packet-oriented data transmission link and are to be forwarded.

10

Description of the Related Art

2 The significance of transmission and switching techniques for high data transmission rates (above 100 Mbit/s) is increasing due to the increasing need for a transmission of video information in modern communications technology. Such video information may include still and moving images in picture telephony applications or the presentation of high-resolution graphics at modern data processing systems.

15

3 A known data transmission method for high transmission bit rates is the "asynchronous transfer mode" (ATM). A data transmission on the basis of the asynchronous transfer mode currently enables a variable transmission bit rate of up to 622 Mbit/s. In this transfer mode, data packets having a fixed length ("ATM cells") are used for the data transport. An ATM cell is composed of a cell header that is five bytes long and contains the switching data relevant for the transport of an ATM cell and of a 48 byte long payload field. Only data allocated to one logical connection – frequently referred to as a virtual channel VC or ATM channel – are transmitted in the payload field of an ATM cell.

20

25

4 US patent no. 5,784,371 discloses a communication network formed of a plurality of communication systems that are connected to one another via an ATM network. The communication systems respectively comprise a timeslot-oriented switching network module for a connection of timeslot-oriented terminal devices to the respective communication system, by which a bidirectional switching of data to

30

be exchanged between the device and the packet-oriented ATM network ensues with the timeslot-oriented switching network modules.

5 The German Patent Application serial number 198 187 76.9 discloses a method that enables a transmission of data belonging to different logical

5 connections in the payload region of one or several ATM cells. To this end, "sub-structure elements" having a variable payload field 0 through 64 bytes long is defined in the payload field of an ATM cell, these sub-structure elements being capable of being respectively allocated to a logical connection via an address field in the cell header of the sub-structure element. Due to the 8-bit long address field in
10 the cell header of a sub-structure element, a maximum of $2^8 = 256$ different logical connections can be addressed. Additionally, at least one sub-structure element is reserved for a transmission of signaling information allocated to the logical connections.

6 The article by Mauger, R., et al., "ATM Adaptation Layer Switching" ISS,
15 World Telecommunications Congress (International Switching Symposium), Ca, Toronto, Pinnacle group, pages 207-214, XP000720525, discloses an arrangement for a switching of data received via a timeslot-oriented data transmission link and a packet-oriented data transmission link. This arrangement comprises both a timeslot-oriented switching network module as well as a packet-oriented switching network
20 module. A switching of data received via the packet-oriented data transmission link and to be forwarded via a packet-oriented data transmission link as well takes place with the packet-oriented switching network module.

SUMMARY OF THE INVENTION

25 7 An object of the present invention is to specify an alternative method that enables a switching of data that are received via a packet-oriented data transmission link and are to be forwarded.

8 This object is achieved by a method for switching data that are received via a packet-oriented data transmission link and are to be forwarded, in which data
30 packets subdivided into sub-structure elements are established for a data transmission via the packet-oriented data transmission link, comprising the steps of

allocating, by a conversion unit, an allocation of the data received via the packet-oriented data transmission link to channels of a timeslot-oriented data format formed of a periodic sequence of channel-individual information segments, such that data allocated to a sub-structure element are allocated to at least one channel of the timeslot-oriented data format; switching the data converted into the timeslot-oriented data format via a timeslot-oriented switching network module; converting the timeslot-oriented data back into the packet-oriented data format; and transmitting the data converted back into the packet-oriented data format via the packet-oriented data transmission link.

9 A critical advantage of the inventive method is that a switching of data allocated to different logical connections and transmitted in one or several data cells can ensue via a traditional timeslot-oriented switching network module. A development of a switching network module designed for the present packet-oriented data format and a signaling adapted to it are thus not necessary.

10 Advantageous developments of the invention include providing that the step of transmitting data via the packet-oriented data transmission link ensues according to the asynchronous transfer mode data format. The inventive method may also include reserving a sub-structure element for a transmission of signaling information allocated to data transmitted via the packet-oriented data transmission link.

Further steps may be added including receiving signaling information by the conversion unit; communicating the received signaling information from the conversion unit to a control unit; and converting the signaling information into switching-oriented control data for the timeslot-oriented switching network module.

Filter cells may be inserted for an adaptation of a transmission bit rate deriving due to an arrival and size of sub-structure elements to a transmission bit rate of a channel. A further step may include inserting filler data into a sub-structure element for an adaptation of a transmission bit rate deriving due to an arrival and a size of sub-structure elements to a transmission bit rate of a channel. Finally the inventive method may include transmitting, for each channel, information about a plurality of payload data communicated in a channel and information about a plurality of filler data communicated in the channel.

11 One advantage of developments of the invention is that, among other things,
the insertion of filler cells or of filler data into a sub-structure element during the
conversion of a packet-oriented data format into a timeslot-oriented data format
makes a switching of compressed data possible without a preceding decompression,
5 which avoids a quality loss in the switching of compressed data.

BRIEF DESCRIPTION OF THE DRAWINGS

12 An exemplary embodiment of the invention is explained in greater detail
below on the basis of the drawings.

10 Figure 1 is a block diagram of the schematic illustration of the critical function
units participating in the inventive method;
Figure 2 is a data structure diagram of the schematic illustration of the
conversion of a packet-oriented data format into a timeslot-oriented data format
according to a first operating mode of a conversion unit; and
15 Figure 3 is a data structure diagram of the schematic illustration of the
conversion of the packet-oriented data format into the timeslot-oriented data format
according to a second operating mode of the conversion unit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

20 13 Figure 1 shows a schematic illustration of a communication system PBX. The
communication system PBX comprises subscriber or network line/trunk modules -- a
line/trunk module ABG is shown by way of example -- for the connection of
communication terminal devices or for a connection to a communication network --
for example, an ISDN-oriented communication network, an analog communication
25 network, a radio communication network or an ATM-based communication network.

14 Furthermore, the communication system PBX contains a timeslot-oriented
switching network module KN comprising a plurality of bidirectional, time-division
multiplex-oriented switching terminals KA, where the time-division multiplex-oriented
switching terminals KA are fashioned as PCM terminals (pulse code modulation),
30 also referred to as PCM highways, speech highways or S_{2M} terminals. Given an
internal data transmission of the communication system, a PCM highway generally

comprises 32 payload channels that are fashioned as ISDN (integrated services digital network)-oriented B-channels with a respective transmission bit rate of 64 kbit/s.

15 A line unit AE and a conversion unit UE are arranged on the line/trunk module
5 ABG. The communication system PBX is connected to an ATM-based communication network ATM-KN via a network interface NA of the line unit AE, the ATM-based communication network ATM-KN being composed of a plurality of communication systems connected to one another. A first and a second communication terminal device KE-A, KE-B are connected to the ATM-based
10 communication network ATM_KN. The line unit AE is connected to a bidirectional, packet-oriented terminal SK of the conversion unit UE via a its own bidirectional, packet-oriented terminal SK.

16 The conversion unit UE is also connected to a switching terminal KA of the timeslot-oriented switching network module KN via its own bidirectional, time-division
15 multiplex-oriented switching terminal KA. The timeslot-oriented switching network module KN is respectively connected, via further switching terminals KA (not shown), to a bidirectional time-division multiplex-oriented terminal SK of further subscribers or line/trunk modules (not shown) arranged in the communication system PBX.

17 A bidirectional conversion between the packet-oriented data format of a
20 connecting line PO-VL between the conversion unit UE and the line unit AE and the timeslot-oriented data format of a connecting line ZO-VL between the conversion unit UE and the timeslot-oriented switching network module KN ensues with the conversion unit UE according to two different operating modes of the conversion unit UE that are described in greater detail below.

25 18 Furthermore, a control unit STE comprising a plurality of control terminals S1, S2 is arranged in the communication system PBX. The control unit STE is connected to a control input SE of the timeslot-oriented switching network module KN via a control terminal S2, and is connected to a control input SE of the line/trunk module ABG via a control terminal S1. The control unit STE is connected to control
30 inputs of further subscribers or line/trunk modules arranged in the communication system PBX via further control terminals (not shown). A communication of signaling

information between the control unit STE and the timeslot-oriented switching network module KN or the line/trunk module ABG ensues according to the HDLC data format (high level data link control).

19 Figure 2 shows a schematic illustration of a conversion of the packet-oriented
5 ATM data format according to the ATM adaption layer AAL type 2 into the timeslot-oriented data format according to the TDM method (time-division multiplex) in a first operating mode of the conversion unit UE. A data transmission in the framework of the packet-oriented ATM data format ensues via ATM cells ATM-Z1, ATM-Z2. An ATM cell ATM-Z1, ATM-Z2 is composed of a five byte long cell header H containing
10 the switching data relevant for the transport of an ATM cell ATM-Z1, ATM-Z2 and of a 48 byte long payload field.

20 In a data transmission in the framework of the packet-oriented ATM data format according to the ATM adaption layer AAL type 2, there is the possibility of subdividing the payload area of an ATM cell ATM-Z1, ATM-Z2 into sub-structure
15 elements SE. The adaptation of the ATM data format -- also frequently referred to as "ATM layer" (layer 2) in the literature -- to the switching layer (layer 3) according to the OSI (open systems interconnection) reference model takes place with the "ATM adaption layer" AAL.

21 A sub-structure element SE according to the ATM adaption layer AAL type 2
20 is composed of a 3 byte long cell header and of a variable-length payload area I (0 through 64 bytes). The cell header of a sub-structure element SE is subdivided into an 8 bit long channel identifier CID, a 6 bit long length indicator LI, a 5 bit long transmitter-receiver indication UUI (user-to-user indication) and a 5 bit long cell header checksum HEC (header error control).

22 As a result of the subdivision of an ATM connection with the assistance of
25 sub-structure elements SE into mutually independent data streams, as shown in Figure 2 with reference to the example of the ATM cells ATM-Z1, ATM-Z2, up to $2^8 = 256$ different logical connections can be addressed within an ATM connection of the basis of the 8 bit long channel identifier CID, all of these logical connections being
30 addressed with the same ATM address -- composed of a VPI (virtual path identifier) value and of a VCI (virtual channel identifier) value. In addition, there is the

possibility of defining a sub-structure element SE for a transmission of signaling information allocated to the logical connections. For a transmission of payload data allocated to the logical connections, one sub-structure element SE can be defined for every currently required logical connection, so that the transmission capacity can
5 be exactly matched to the current need.

23 For example, four different sub-structure elements SE are shown in Figure 2 that are defined on the basis of different channel identifier CID in the cell header -- referred to below as the sub-structure element header 0, 1, 2, 3 -- of the sub-structure elements SE. A payload field I of variable length (0 through 2^6 bytes) can
10 be defined by the 6 bit long length indicator LI in the cell header, so that a data transmission with a variable transmission bit rate can be realized for the different logical connections.

24 For a conversion of the packet-oriented data format according to the ATM adaption layer AAL type 2 onto the timeslot-oriented data format according to the
15 TDM method, a TDM channel K0 through K3 of the timeslot-oriented data format according to the TDM method is allocated to each element SE of an ATM cell ATM-Z1, ATM-Z2 defined for a transmission of payload data. An allocation of a sub-structure element SE to a TDM channel K0 through K3 ensues in a signaling phase preceding the payload transmission. 32 payload channels, which are configured as
20 ISDN-oriented B-channels with a constant transmission bit rate of respectively 64 kbit/s, are generally available for a data transmission in the framework of the timeslot-oriented data format according to the TDM method.

25 In the framework of the conversion of the packet-oriented data format according to the ATM adaption layer AAL type 2 onto the timeslot-oriented data format according to the TDM method, an adaptation of the (potentially variable)
25 transmission bit rate of the packet-oriented data format deriving due to the size and the arrival of sub-structure elements SE onto the constant transmission bit rate of 64 kbit/s of the timeslot-oriented data format must additionally ensue. This is achieved in the scope of the first operating mode of the conversion unit UE by an insertion of
30 "filler cells" FZ of variable length into the continuous TDM data stream.

26 The sub-structure element SE received via the packet-oriented connecting line PO-VL and packed in ATM cells ATM-Z1, ATM-Z2 must be unpacked in the conversion unit UE. For the conversion of the (potentially variable) transmission bit rate deriving due to the size and the arrival of the sub-structure elements SE onto
5 the constant transmission bit rate of 64 kbit/s of the timeslot-oriented data format, filler cells FZ are subsequently attached to the sub-structure elements SE containing the payload data. The length of a filler cell FZ is defined by a filler cell header FZH. The length of a filler cell FZ is selected such that the overall transmission bit rate of a sub-structure element SE and of a filler cell FZ yields a whole multiple of 64 kbit/s.
10 When the transmission bit rate of a sub-structure element SE is higher than 64 kbit/s -- i.e., higher than the transmission bit rate of a TDM channel K1 through K4 -- the payload data communicated in a sub-structure element SE are divided onto a plurality of TDM channels K1 through K4.

27 In conclusion, these data (sub-structure elements SE and filler cells FZ
15 together) are allocated to a TDM channel K0, K1 of the timeslot-oriented connecting line ZO-VL declared in the signaling phase and are transmitted via this to the timeslot-oriented switching network module KN.

28 The signaling information communicated from the conversion unit UE to the control unit STE of the communication system PBX in the framework of the signaling
20 phase are converted in the control unit STE into switching-oriented control data for the timeslot-oriented switching network module KN. A switching of the data (sub-structure elements SE and filler cells FZ together) received via the respective TDM channels K0 through K3 of the timeslot-oriented connecting line ZO-VL ensues in the timeslot-oriented switching network module KN on the basis of the switching-
25 oriented control data, i.e., an allocation of a TDM channel of an input line of the timeslot-oriented switching network module KN onto a TDM channel of an output line of the timeslot-oriented switching network module KN.

29 When the payload data to be communicated are to be transmitted anew via the ATM-based communication network ATM-KN to a receiver, the data (sub-
30 structure elements SE and filler cells FZ together) are transmitted from the timeslot-oriented switching network module KN to the conversion unit UE, where the filler

cells FZ are removed from the TDM data stream, so that the data stream then only comprises sub-structure elements SE containing payload data. The sub-structure elements SE to be transmitted are packed in ATM cells ATM-Z1, ATM-Z2 in the conversion unit UE and are communicated via the ATM-based communication network ATM-KN to the addressed recipient. When the data are to be transmitted to, for example, an internal communication terminal device (not shown), then these are transmitted directly to a subscriber line module (not shown) via which the addressed communication terminal device is connected to the communication system PBX.

30 Figure 3 shows a schematic illustration of a conversion of the packet-oriented ATM data format according to the ATM adaption layer AAL type 2 into the timeslot-oriented data format according to the TDM method (time division multiplex) in a second operating mode of the conversion unit UE.

31 In contrast to the first operating mode of the conversion unit UE, no separate filler cells FZ are inserted into the continuous TDM data stream in the second operating mode. An adaptation of the (potentially variable) transmission bit rate of the packet-oriented data format to the constant transmission bit rate of 64 kbit/s of the timeslot-oriented data format ensues by filling the sub-structure elements SE with filler data FD, so that the overall transmission bit rate of a sub-structure element SE (payload data and filler data FD together) yields a whole multiple of 64 bit/s. This, however, assumes that each TDM channel K0 through K3 additionally has information about the length of the sub-structure elements SE that is transmitted and supplemented with filler data FD allocated to it such that a separation of the payload data to be transmitted from the filler data FD is enabled with the assistance of this information.

32 When, proceeding from the first communication terminal device KE-A, data are to be communicated to the second communication terminal device KE-B, the first communication terminal device KE-A sends the necessary signaling information to the communication system PBX in the framework of a signaling phase preceding the payload transmission, sending these information via a defined sub-structure element SE of a first ATM channel V-A, which is frequently abbreviated as VC

(virtual channel) in the literature. The transmitted signaling information are unpacked in the conversion unit UE, converted into the HDLC data format and communicated to the control unit STE.

33 On the basis of the communicated signaling information, a TDM channel --
5 for example, the TDM channel 17 -- of the timeslot-oriented connecting line ZO-VL is allocated to the sub-structure elements SE of the first ATM channel V-A that are defined for the transmission of the payload data from the first communication terminal device KE-A to the communication system PBX. Furthermore, the communicated signaling information are converted into switching-oriented control
10 data for the timeslot-oriented switching network module KN. The switching-oriented control data define which input TDM channel -- for example, the TDM channel 17 of the timeslot-oriented connecting line ZO-VL -- is connected to which output TDM channel of the timeslot-oriented switching network module KN -- for example, the TDM channel 23 of the timeslot-oriented connecting line ZO-VL.

15 34 Subsequently, the first communication terminal device KE-A packs payload data to be transmitted into sub-structure elements SE that are in turn packed in ATM cells ATM-Z1, ATM-Z2 and subsequently communicated via the first ATM channel V-A to the communication system PBX. The sub-structure elements SE are unpacked from the ATM cells ATM-Z1, ATM-Z2 in the conversion unit UE. In a next step, the
20 transmission bit rate deriving due to the size and the arrival of the sub-structure elements SE is matched to the constant transmission bit rate of 64 kbit/s by inserting filler cells FZ according to the first operating mode of the conversion unit UE.

35 The data -- composed of sub-structure elements SE and filler cells FZ -- are subsequently forwarded via the TDM channel 17 of the timeslot-oriented connecting
25 line ZO-VL to the timeslot-oriented switching network module KN. The data are switched onto the TDM channel 23 of the timeslot-oriented connecting line ZO-VL by the timeslot-oriented switching network module KN and are sent back to the conversion unit UE. The filler cells FZ are removed from the continuous data stream in the conversion unit UE, so that the data stream is not composed only of sub-
30 structure elements SE containing payload data. These sub-structure elements SE

are subsequently packed into ATM cells ATM-Z1, ATM-Z2 and transmitted to the second communication terminal device KE-B via a second ATM channel V-B.

36 The above-described method is illustrative of the principles of the present invention. Numerous modifications and adaptations thereof will be readily apparent
5 to those skilled in this art without departing from the spirit and scope of the present invention.

ABSTRACT

- 37 Data packets (ATM-Z1, ATM-Z2) partitioned into substructure elements (SE) are set up for data transmission via the packet oriented data transmission path. Channels with a time slot oriented format (TDM) are assigned to the data received
- 5 via the packet oriented data transmission path by a conversion unit (UE). The converted data is then switched via a time slot oriented switching matrix module (KN).

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- 10 Deletions appear as Overstrike text surrounded by []
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SPECIFICATION

TITLE

- 15 METHOD FOR SWITCHING DATA RECEIVED VIA A PACKET-ORIENTED DATA
TRANSMISSION PATH

BACKGROUND OF THE INVENTION

Field of the Invention

- 20 **1 The invention is directed to a method for switching data that are received via a packet-oriented data transmission link and are to be forwarded.**

Description of the Related Art

- 25 **2** The significance of transmission and switching techniques for high data transmission rates (above 100 Mbit/s) is increasing due to the increasing need for a transmission of video information in modern communications technology [~~such as, for example,~~]. **Such video information may include** still and moving images in picture telephony applications or the presentation of high-resolution graphics at modern data processing systems.
- 30 **3** A known data transmission method for high transmission bit rates is [~~what is referred to as the asynchronous~~] **the "asynchronous transfer [mode] mode" (ATM).**
A data transmission on the basis of the asynchronous transfer mode currently enables a variable transmission bit rate of up to 622 Mbit/s. In [~~the transmission technique known as asynchronous~~] **this** transfer mode[~~(ATM)~~], data packets having
35 a fixed length[~~, what are referred to as ATM cells,~~] (**"ATM cells"**) are used for the data transport. An ATM cell is composed of a cell header that is five bytes long and

contains the switching data relevant for the transport of an ATM cell and of a 48 byte long payload field. Only data allocated to one logical connection – frequently referred to as a virtual channel VC or ATM channel – ~~[in the literature are thereby]~~ **are** transmitted in the payload field of an ATM cell.

5 ~~[US Published Application US-A-5784371]~~ **4 US patent no. 5,784,371** discloses a communication network formed of a plurality of communication systems that are connected to one another via an ATM network. The communication systems respectively comprise a timeslot-oriented switching network module for a connection of timeslot-oriented terminal devices to the respective communication system,
10 ~~[whereby]~~ **by which** a bidirectional switching of data to be exchanged ~~[bet [...]]~~ **between the** device and the packet-oriented ATM network ensues with the timeslot-oriented switching network modules.

5 The German Patent Application ~~[bearing the]~~ serial number 198 187 76.9 ~~[has already disclosed]~~ **discloses** a method that enables a transmission of data
15 belonging to different logical connections in the payload region of one or, ~~respectively,~~ several ATM cells. To this end, ~~[what are referred to as sub-]~~ **“sub-structure [elements] elements”** having a variable payload field 0 through 64 bytes long is defined in the payload field of an ATM cell, ~~[said]~~ **these** sub-structure elements being capable of being respectively allocated to a logical connection via an
20 address field in the cell header of the sub-structure element. Due to the 8-bit long address field in the cell header of a sub-structure element, a maximum of $2^8 = 256$ different logical connections can be addressed. Additionally, at least one sub-structure element is reserved for a transmission of signaling information allocated to the logical connections.

25 **6** The article by Mauger, R., et al., “ATM Adaptation Layer Switching” ISS, World Telecommunications Congress (International Switching Symposium), Ca, Toronto, Pinnacle group, pages 207-214, XP000720525, discloses an arrangement for a switching of data received via a timeslot-oriented data transmission link and a packet-oriented data transmission link. ~~[The]~~ **This** arrangement ~~[thereby]~~ comprises
30 both a timeslot-oriented switching network module as well as a packet-oriented switching network module. A switching of data received via the packet-oriented data transmission link and to be forwarded via a packet-oriented data transmission link as

well ~~[thereby ensues]~~ takes place with the packet-oriented switching network module.

SUMMARY OF THE INVENTION

5 7 An object of the present invention is to specify an alternative method ~~[with which]~~ that enables a switching of data that are received via a packet-oriented data transmission link and are to be forwarded ~~[is enabled.]~~.

~~[Proceeding from the features of the preamble of patent claim 1, this object is inventively achieved by the characterizing features thereof.]~~ 8 This object is

10 achieved by a method for switching data that are received via a packet-oriented data transmission link and are to be forwarded, in which data packets subdivided into sub-structure elements are established for a data transmission via the packet-oriented data transmission link, comprising the steps of allocating, by a conversion unit, an allocation of the data received via the
15 packet-oriented data transmission link to channels of a timeslot-oriented data format formed of a periodic sequence of channel-individual information segments, such that data allocated to a sub-structure element are allocated to at least one channel of the timeslot-oriented data format; switching the data converted into the timeslot-oriented data format via a timeslot-oriented
20 switching network module; converting the timeslot-oriented data back into the packet-oriented data format; and transmitting the data converted back into the packet-oriented data format via the packet-oriented data transmission link.

9 A critical advantage of the inventive method is ~~[then comprised therein]~~ that a switching of data allocated to different logical connections and transmitted in one or~~,~~
25 ~~respectively,]~~ several data cells can ensue via a traditional timeslot-oriented switching network module. A development of a switching network module designed for the present packet-oriented data format and a signaling adapted ~~[thereto]~~ to it are thus not necessary.

10 Advantageous developments of the invention ~~[are recited in the subclaims.~~
30 include providing that the step of transmitting data via the packet-oriented data transmission link ensues according to the asynchronous transfer mode data format. The inventive method may also include reserving a sub-structure

element for a transmission of signaling information allocated to data
transmitted via the packet-oriented data transmission link. Further steps
may be added including receiving signaling information by the conversion
unit; communicating the received signaling information from the conversion
5 unit to a control unit; and converting the signaling information into switching-
oriented control data for the timeslot-oriented switching network module.
Filter cells may be inserted for an adaptation of a transmission bit rate deriving
due to an arrival and size of sub-structure elements to a transmission bit rate
of a channel. A further step may include inserting filler data into a sub-
10 structure element for an adaptation of a transmission bit rate deriving due to
an arrival and a size of sub-structure elements to a transmission bit rate of a
channel. Finally the inventive method may include transmitting, for each
channel, information about a plurality of payload data communicated in a
channel and information about a plurality of filler data communicated in the
15 channel.

11 One advantage of developments of the invention ~~[defined in the subclaims is
comprised]~~ **is that**, among other things, ~~[therein that]~~ the insertion of filler cells or,
respectively, of filler data into a sub-structure element during the conversion of a
packet-oriented data format into a timeslot-oriented data format makes a switching of
20 compressed data possible without a preceding decompression~~[-A]~~, **which avoids a**
quality loss in the switching of compressed data ~~[is thus avoided]~~.
].

BRIEF DESCRIPTION OF THE DRAWINGS

12 An exemplary embodiment of the invention is explained in greater detail below
on the basis of the **drawings**. ~~[drawing]~~.

Thereby shown are:]

Figure 1 ~~[a-structogram]~~ **is a block diagram** of the schematic illustration of the
critical function units participating in the inventive method;

30 Figure 2 ~~[a-structogram]~~ **is a data structure diagram** of the schematic
illustration of the conversion of a packet-oriented data format into a timeslot-oriented
data format according to a first operating mode of a conversion unit; **and**

Figure 3 ~~[a-structogram]~~ is a data structure diagram of the schematic illustration of the conversion of the packet-oriented data format into the timeslot-oriented data format according to a second operating mode of the conversion unit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

13 Figure 1 shows a schematic illustration of a communication system PBX. The communication system PBX comprises subscriber or~~[, respectively,]~~ network line/trunk modules ~~[B]~~-- a line/trunk module ABG is shown by way of example ~~[B]~~-- for the connection of communication terminal devices or~~[, respectively,]~~ for a connection to a communication network ~~[B]~~-- for example, an ISDN-oriented communication network, an analog communication network, a radio communication network or an ATM-based communication network.

~~[Further]~~ **14 Furthermore**, the communication system PBX contains a timeslot-oriented switching network module KN comprising a plurality of bidirectional, time-division multiplex-oriented switching terminals KA, ~~[whereby]~~ **where** the time-division multiplex-oriented switching terminals KA are fashioned as PCM terminals (pulse code modulation), also referred to as PCM highways, speech highways or S_{2M} terminals. Given an internal data transmission of the communication system, a PCM highway generally comprises 32 payload channels that are fashioned as ISDN ~~[oriented B-channels]~~(integrated services digital network)-**oriented B-channels** with a respective transmission bit rate of 64 kbit/s.

15 A line unit AE and a conversion unit UE are arranged on the line/trunk module ABG. The communication system PBX is connected to an ATM-based communication network ATM-KN via a network interface NA of the line unit AE, ~~[said]~~ **the** ATM-based communication network ATM-KN being composed of a plurality of communication systems connected to one another. A first and a second communication terminal device KE-A, KE-B are connected to the ATM-based communication network ATM_KN. The line unit AE is connected to a bidirectional, packet-oriented terminal SK of the conversion unit UE via a **its own** bidirectional, packet-oriented terminal SK.

~~[[sic]]~~

16 The conversion unit UE~~[, further,]~~ is **also** connected to a switching terminal KA of the timeslot-oriented switching network module KN via ~~[a]~~ **its own** bidirectional, time-division multiplex-oriented switching terminal KA. ~~[[sic] Via further switching terminals KA (not shown), the]~~ **The** timeslot-oriented switching network module KN is
5 respectively connected, **via further switching terminals KA (not shown)**, to a bidirectional time-division multiplex-oriented terminal SK of further ~~[subscriber or, respectively,]~~ **subscribers or** line/trunk modules (not shown) arranged in the communication system PBX.

17 A bidirectional conversion between the packet-oriented data format of a
10 connecting line PO-VL between the conversion unit UE and the line unit AE and the timeslot-oriented data format of a connecting line ZO-VL between the conversion unit UE and the timeslot-oriented switching network module KN ensues with the conversion unit UE according to two different operating modes of ~~[said]~~ **the** conversion unit UE that are described in greater detail below.

18 **Furthermore**, a control unit STE comprising a plurality of control
15 terminals S1, S2 is arranged in the communication system PBX. The control unit STE is connected to a control input SE of the timeslot-oriented switching network module KN via a control terminal S2, and is connected to a control input SE of the line/trunk module ABG via a control terminal S1. The control unit STE is connected
20 to control inputs of further ~~[subscriber or, respectively,]~~ **subscribers or** line/trunk modules arranged in the communication system PBX via further control terminals (not shown). A communication of signaling information between the control unit STE and the timeslot-oriented switching network module KN or~~[, respectively,]~~ the line/trunk module ABG ~~[thereby]~~ ensues according to the HDLC data format (high
25 level data link control).

19 Figure 2 shows a schematic illustration of a conversion of the packet-oriented ATM data format according to the ATM adaption layer AAL type 2 into the timeslot-oriented data format according to the TDM method (time-division multiplex) in a first operating mode of the conversion unit UE. A data transmission in the framework of
30 the packet-oriented ATM data format ensues via ATM cells ATM-Z1, ATM-Z2. An ATM cell ATM-Z1, ATM-Z2 is composed of a five byte long cell header H containing

the switching data relevant for the transport of an ATM cell ATM-Z1, ATM-Z2 and of a 48 byte long payload field.

20 In a data transmission in the framework of the packet-oriented ATM data format according to the ATM adaption layer AAL type 2, there is the possibility of subdividing the payload area of an ATM cell ATM-Z1, ATM-Z2 into sub-structure elements SE. The adaptation of the ATM data format [B]-- also frequently referred to as [AATM-layer@]“**ATM layer**” (layer 2) in the literature [B]-- to the switching layer (layer 3) according to the OSI [reference model](open systems interconnection) [thereby ensues with what is referred to as the ATM] **reference model takes place with the “ATM adaption [layer] layer” AAL.**

21 A sub-structure element SE according to the ATM adaption layer AAL type 2 is composed of a 3 byte long cell header and of a variable-length payload area I (0 through 64 bytes). The cell header of a sub-structure element SE is subdivided into an 8 bit long channel identifier CID, a 6 bit long length indicator LI, a 5 bit long transmitter-receiver indication UI (user-to-user indication) and a 5 bit long cell header checksum HEC (header error control).

22 As a result of the subdivision of an ATM connection with the assistance of sub-structure elements SE into mutually independent data streams, as shown in [the] Figure 2 with reference to the example of the ATM cells ATM-Z1, ATM-Z2, up to $2^8 =$ 256 different logical connections can be addressed within an ATM connection of the basis of the 8 bit long channel identifier CID, all of these logical connections being addressed with the same ATM address [B]-- composed of a VPI [value](virtual path identifier) **value** and of a VCI [value](virtual channel identifier) **value**. In addition, there is the possibility of defining a sub-structure element SE for a transmission of signaling information allocated to the logical connections. For a transmission of payload data allocated to the logical connections, one sub-structure element SE can be defined for every currently required logical connection, so that the transmission capacity can be exactly matched to the current need.

23 For example, four different sub-structure elements SE are shown in [the] Figure 2 that are defined on the basis of different channel identifier CID in the cell header [B]-- referred to below as **the** sub-structure element header 0, 1, 2, 3 [B]-- of the sub-structure elements SE. A payload field I of variable length (0 through 2^6

bytes) can be defined by the 6 bit long length indicator LI in the cell header, so that a data transmission with a variable transmission bit rate can be realized for the different logical connections.

24 For a conversion of the packet-oriented data format according to the ATM adaption layer AAL type 2 onto the timeslot-oriented data format according to the TDM method, a TDM channel K0[, ...,] through K3 of the timeslot-oriented data format according to the TDM method is allocated to each element SE of an ATM cell ATM-Z1, ATM-Z2 defined for a transmission of payload data. An allocation of a sub-structure element SE to a TDM channel K0[, ...,] through K3 [thereby] ensues in a signaling phase preceding the payload transmission. 32 payload channels, which are configured as ISDN-oriented B-channels with a constant transmission bit rate of respectively 64 kbit/s, are generally available for a data transmission in the framework of the timeslot-oriented data format according to the TDM method.

25 In the framework of the conversion of the packet-oriented data format according to the ATM adaption layer AAL type 2 onto the timeslot-oriented data format according to the TDM method, an adaptation of the [~~B-potentially variable B~~](**potentially variable**) transmission bit rate of the packet-oriented data format deriving due to the size and the arrival of sub-structure elements SE onto the constant transmission bit rate of 64 kbit/s of the timeslot-oriented data format must additionally ensue. This is achieved in the scope of the first operating mode of the conversion unit UE by an insertion of [~~what are referred to as filler cells~~]"**filler cells**" FZ of variable length into the continuous TDM data stream.

26 The sub-structure element SE received via the packet-oriented connecting line PO-VL and packed in ATM cells ATM-Z1, ATM-Z2 must be unpacked in the conversion unit UE. For the conversion of the [~~B-potentially variable B~~](**potentially variable**) transmission bit rate deriving due to the size and the arrival of the sub-structure elements SE onto the constant transmission bit rate of 64 kbit/s of the timeslot-oriented data format, [~~what are referred to as~~] filler cells FZ are subsequently attached to the sub-structure elements SE containing the payload data. The length of a filler cell FZ is defined by [~~what is referred to as~~] a filler cell header FZH. [~~the~~] **The** length of a filler cell FZ is [thereby] selected such that the overall transmission bit rate of a sub-structure element SE and of a filler cell FZ

yields a whole multiple of 64 kbit/s. When the transmission bit rate of a sub-structure element SE is higher than 64 kbit/s [B]-- i.e., higher than the transmission bit rate of a TDM channel K1[,...], **through** K4 [B]-- the payload data communicated in a sub-structure element SE are divided onto a plurality of TDM channels K1[,...], **through** K4.

27 In conclusion, these data (sub-structure elements SE and filler cells [FX] FZ together) are allocated to a TDM channel K0, [...] K1 of the timeslot-oriented connecting line ZO-VL declared in the signaling phase and are transmitted via this to the timeslot-oriented switching network module KN.

28 The signaling information communicated from the conversion unit UE to the control unit STE of the communication system PBX in the framework of the signaling phase are converted in the control unit STE into switching-oriented control data for the timeslot-oriented switching network module KN. A switching of the data (sub-structure elements SE and filler cells FZ together) received via the respective TDM channels K0[,...], **through** K3 of the timeslot-oriented connecting line ZO-VL ensues in the timeslot-oriented switching network module KN on the basis of the switching-oriented control data, i.e., an allocation of a TDM channel of an input line of the timeslot-oriented switching network module KN onto a TDM channel of an output line of the timeslot-oriented switching network module KN.

29 When the payload data to be communicated are to be transmitted anew via the ATM-based communication network ATM-KN to a receiver, the data (sub-structure elements SE and filler cells FZ together) are transmitted from the timeslot-oriented switching network module KN to the conversion unit UE, [wherein] **where** the filler cells FZ are removed from the TDM data stream, so that the data stream then only comprises sub-structure elements SE containing payload data. The sub-structure elements SE to be transmitted are packed in ATM cells ATM-Z1, ATM-Z2 in the conversion unit UE and are communicated via the ATM-based communication network ATM-KN to the addressed recipient. When the data are to be transmitted to, for example, an internal communication terminal device (not shown), then these are transmitted directly to a subscriber line module (not shown) via which the addressed communication terminal device is connected to the communication system PBX.

30 Figure 3 shows a schematic illustration of a conversion of the packet-oriented ATM data format according to the ATM adaption layer AAL type 2 into the timeslot-oriented data format according to the TDM method (time division multiplex) in a second operating mode of the conversion unit UE.

5 **31** In contrast to the first operating mode of the conversion unit UE, no separate filler cells FZ are inserted into the continuous TDM data stream in the second operating mode. An adaptation of the ~~[B-potentially-variable B]~~**(potentially variable)** transmission bit rate of the packet-oriented data format to the constant transmission bit rate of 64 kbit/s of the timeslot-oriented data format ensues by filling the sub-structure elements SE with filler data FD, so that the overall transmission bit rate of a sub-structure element SE (payload data and filler data FD together) yields a whole multiple of 64 bit/s. This, however, assumes that each TDM channel K0[, ...,]
10 **through** K3 additionally has ~~[an]~~ information about the length of the sub-structure elements SE that is transmitted and supplemented with filler data FD allocated to it such that a separation of the payload data to be transmitted from the filler data FD is enabled with the assistance of this information.

15 **32** When, proceeding from the first communication terminal device KE-A, data are to be communicated to the second communication terminal device KE-B, the first communication terminal device KE-A sends the necessary signaling information to the communication system PBX in the framework of a signaling phase preceding the payload transmission, sending these information via a defined sub-structure element SE of a first ATM channel V-A, which is frequently abbreviated as VC (virtual channel) in the literature. The transmitted signaling information are unpacked in the conversion unit UE, converted into the HDLC data format and communicated to the control unit STE.
25

33 On the basis of the communicated signaling information, a TDM channel ~~[B]~~-- for example, the TDM channel 17 ~~[B]~~-- of the timeslot-oriented connecting line ZO-VL is allocated to the sub-structure elements ~~[Se]~~ **SE** of the first ATM channel V-A that are defined for the transmission of the payload data from the first communication terminal device KE-A to the communication system PBX. ~~[Further]~~ **Furthermore**, the communicated signaling information are converted into switching-oriented control data for the timeslot-oriented switching network module KN. The switching-oriented
30

control data define which input TDM channel [B]-- for example, the TDM channel 17 of the timeslot-oriented connecting line ZO-VL [B]-- is connected to which output TDM channel of the timeslot-oriented switching network module KN [B]-- for example, the TDM channel 23 of the timeslot-oriented connecting line ZO-VL.

5 **34** Subsequently, the first communication terminal device KE-A packs payload data to be transmitted into sub-structure elements SE that are in turn packed in ATM cells ATM-Z1, ATM-Z2 and subsequently communicated via the first ATM channel V-A to the communication system PBX. The sub-structure elements SE are unpacked from the ATM cells ATM-Z1, ATM-Z2 in the conversion unit UE. In a next step, the
10 transmission bit rate deriving due to the size and the arrival of the sub-structure elements SE is matched to the constant transmission bit rate of 64 kbit/s by inserting filler cells FZ according to the first operating mode of the conversion unit UE.

35 The data [B]-- composed of sub-structure elements SE and filler cells FZ [B]-- are subsequently forwarded via the TDM channel 17 of the timeslot-oriented
15 connecting line ZO-VL to the timeslot-oriented switching network module KN. The data are switched onto the TDM channel 23 of the timeslot-oriented connecting line ZO-VL by the timeslot-oriented switching network module KN and are sent back to the conversion unit UE. The filler cells FZ are removed from the continuous data stream in the conversion unit UE, so that the data stream is not composed only of
20 sub-structure elements SE containing payload data. These sub-structure elements SE are subsequently packed into ATM cells ATM-Z1, ATM-Z2 and transmitted to the second communication terminal device KE-B via a second ATM channel V-B.

36 The above-described method is illustrative of the principles of the present invention. Numerous modifications and adaptations thereof will be readily apparent to those skilled in this art without departing from the spirit and scope of the present invention.
25

ABSTRACT

37 Data packets (ATM-Z1, ATM-Z2) partitioned into substructure elements
(SE) are set up for data transmission via the packet oriented data transmission
path. Channels with a time slot oriented format (TDM) are assigned to the data
5 received via the packet oriented data transmission path by a conversion unit
(UE). The converted data is then switched via a time slot oriented switching
matrix module (KN).

Substitute Page

1

**METHOD FOR SWITCHING DATA RECEIVED VIA A PACKET-
ORIENTED DATA TRANSMISSION PATH**

The significance of transmission and switching techniques for high data transmission rates (above 100 Mbit/s) is increasing due to the increasing need for a transmission of video information in modern communications technology such as, for example, still and moving images in picture telephony applications or the presentation of high-resolution graphics at modern data processing systems. A known data transmission method for high transmission bit rates is what is referred to as the asynchronous transfer mode (ATM). A data transmission on the basis of the asynchronous transfer mode currently enables a variable transmission bit rate of up to 622 Mbit/s.

In the transmission technique known as asynchronous transfer mode (ATM), data packets having a fixed length, what are referred to as ATM cells, are used for the data transport. An ATM cell is composed of a cell header that is five bytes long and contains the switching data relevant for the transport of an ATM cell and of a 48 byte long payload field. Only data allocated to one logical connection – frequently referred to as virtual channel VC or ATM channel in the literature – are thereby transmitted in the payload field of an ATM cell.

US Published Application US-A-5784371 discloses a communication network formed of a plurality of communication systems that are connected to one another via an ATM network. The communication systems respectively comprise a timeslot-oriented switching network module for a connection of timeslot-oriented terminal devices to the respective communication system, whereby a bidirectional switching of data to be exchanged bet [...] device and the packet-oriented ATM network ensues with the timeslot-oriented switching network modules.

The German Patent Application bearing the serial number 198 187 76.9 has already disclosed a method that enables a transmission of data belonging to

different logical connections in the payload region of one or, respectively, several ATM cells. To this end, what are referred to as sub-structure elements having a variable payload field 0 through 64 bytes long is defined in the payload field of an ATM cell, said sub-structure elements being capable of being respectively allocated to a logical connection via an address field in the cell header of the sub-structure element. Due to the 8-bit long address field in the cell header of a sub-structure element, a maximum of $2^8 = 256$ different logical connections can be addressed. Additionally, at least one sub-structure element is reserved for a transmission of signaling information allocated to the logical connections.

The article by Mauger, R., et al., "ATM Adaptation Layer Switching" ISS, World Telecommunications Congress (International Switching Symposium), Ca, Toronto, Pinnacle group, pages 207-214, XP000720525, discloses an arrangement for a switching of data received via a timeslot-oriented data transmission link and a packet-oriented data transmission link. The arrangement thereby comprises both a timeslot-oriented switching network module as well as a packet-oriented switching network module. A switching of data received via the packet-oriented data transmission link and to be forwarded via a packet-oriented data transmission link as well thereby ensues with the packet-oriented switching network module.

An object of the present invention is to specify an alternative method with which a switching of data that are received via a packet-oriented data transmission link and are to be forwarded is enabled.

Proceeding from the features of the preamble of patent claim 1, this object is inventively achieved by the characterizing features thereof.

A critical advantage of the inventive method is then comprised therein that a switching of data allocated to different logical connections and transmitted in one or, respectively, several data cells can ensue via a traditional timeslot-oriented switching network module. A development of a switching network module designed for the

present packet-oriented data format and a signaling adapted thereto are thus not necessary.

Advantageous developments of the invention are recited in the subclaims.

5 One advantage of developments of the invention defined in the subclaims is comprised, among other things, therein that the insertion of filler cells or, respectively, of filler data into a sub-structure element during the conversion of a packet-oriented data format into a timeslot-oriented data format makes a switching of compressed data possible without preceding decompression. A quality loss in the
10 switching of compressed data is thus avoided.

An exemplary embodiment of the invention is explained in greater detail below on the basis of the drawing.

Thereby shown are:

- 15 Figure 1 a structogram of the schematic illustration of the critical function units participating in the inventive method;
- Figure 2 a structogram of the schematic illustration of the conversion of a packet-oriented data format into a timeslot-oriented data format according to a first operating mode of a conversion unit;
- 20 Figure 3 a structogram of the schematic illustration of the conversion of the packet-oriented data format into the timeslot-oriented data format according to a second operating mode of the conversion unit.

Figure 1 shows a schematic illustration of a communication system PBX. The communication system PBX comprises subscriber or, respectively, network line/trunk modules – a line/trunk module ABG is shown by way of example – for the connection of communication terminal devices or, respectively, for a connection to a communication network – for example, an ISDN-oriented communication network, an analog communication network, a radio communication network or an ATM-based communication network.

Further, the communication system PBX contains a timeslot-oriented switching network module KN comprising a plurality of bidirectional, time-division multiplex-oriented switching terminals KA, whereby the time-division multiplex-oriented switching terminals KA are fashioned as PCM terminals (pulse code modulation), also referred to as PCM highways, speech highways or S_{2M} terminals. Given an internal data transmission of the communication system, a PCM highway generally comprises 32 payload channels that are fashioned as ISDN-oriented B-channels (integrated services digital network) with a respective transmission bit rate of 64 kbit/s.

A line unit AE and a conversion unit UE are arranged on the line/trunk module ABG. The communication system PBX is connected to an ATM-based communication network ATM-KN via a network interface NA of the line unit AE, said ATM-based communication network ATM-KN being composed of a plurality of communication systems connected to one another. A first and a second communication terminal device KE-A, KE-B are connected to the ATM-based communication network ATM_KN. The line unit AE is connected to a bidirectional, packet-oriented terminal SK of the conversion unit UE via a bidirectional, packet-oriented terminal SK. [sic]

The conversion unit UE, further, is connected to a switching terminal KA of the timeslot-oriented switching network module KN via a bidirectional, time-division multiplex-oriented switching terminal KA. [sic] Via further switching terminals KA (not shown), the timeslot-oriented switching network module KN is

respectively connected to a bidirectional time-division multiplex-oriented terminal SK of further subscriber or, respectively, line/trunk modules (not shown) arranged in the communication system PBX.

5 A bidirectional conversion between the packet-oriented data format of a connecting line PO-VL between the conversion unit UE and the line unit AE and the timeslot-oriented data format of a connecting line ZO-VL between the conversion unit UE and the timeslot-oriented switching network module KN ensues with the conversion unit UE according to two different operating modes of said conversion unit UE that are described in greater detail below.

10 Further, a control unit STE comprising a plurality of control terminals S1, S2 is arranged in the communication system PBX. The control unit STE is connected to a control input SE of the timeslot-oriented switching network module KN via a control terminal S2, and is connected to a control input SE of the line/trunk module ABG via a control terminal S1. The control unit STE is connected to control inputs of
15 further subscriber or, respectively, line/trunk modules arranged in the communication system PBX via further control terminals (not shown). A communication of signaling information between the control unit STE and the timeslot-oriented switching network module KN or, respectively, the line/trunk module ABG thereby ensues according to the HDLC data format (high level data link control).

20 Figure 2 shows a schematic illustration of a conversion of the packet-oriented ATM data format according to the ATM adaption layer AAL type 2 into the timeslot-oriented data format according to the TDM method (time-division multiplex) in a first operating mode of the conversion unit UE. A data transmission in the framework of the packet-oriented ATM data format ensues via ATM cells ATM-Z1,
25 ATM-Z2. An ATM cell ATM-Z1, ATM-Z2 is composed of a five byte long cell header H containing the switching data relevant for the transport of an ATM cell ATM-Z1, ATM-Z2 and of a 48 byte long payload field.

In a data transmission in the framework of the packet-oriented ATM data format according to the ATM adaption layer AAL type 2, there is the possibility of

subdividing the payload area of an ATM cell ATM-Z1, ATM-Z2 into sub-structure elements SE. The adaptation of the ATM data format – also frequently referred to as "ATM layer" (layer 2) in the literature – to the switching layer (layer 3) according to the OSI reference model (open systems interconnection) thereby ensues with what is
 5 referred to as the ATM adaption layer AAL.

A sub-structure element SE according to the ATM adaption layer AAL type 2 is composed of a 3 byte long cell header and of a variable-length payload area I (0 through 64 bytes). The cell header of a sub-structure element SE is subdivided into an 8 bit long channel identifier CID, a 6 bit long length indicator LI, a 5 bit long
 10 transmitter-receiver indication UII (user-to-user indication) and a 5 bit long cell header checksum HEC (header error control).

As a result of the subdivision of an ATM connection with the assistance of sub-structure elements SE into mutually independent data streams, as shown in the Figure with reference to the example of the ATM cells ATM-Z1, ATM-Z2, up to $2^8 =$
 15 256 different logical connections can be addressed within an ATM connection of the basis of the 8 bit long channel identifier CID, all of these logical connections being addressed with the same ATM address – composed of a VPI value (virtual path identifier) and of a VCI value (virtual channel identifier). In addition, there is the possibility of defining a sub-structure element SE for a transmission of signaling
 20 information allocated to the logical connections. For a transmission of payload data allocated to the logical connections, one sub-structure element SE can be defined for every currently required logical connection, so that the transmission capacity can be exactly matched to the current need.

For example, four different sub-structure elements SE are shown in the
 25 Figure that are defined on the basis of different channel identifier CID in the cell header – referred to below as sub-structure element header 0, 1, 2, 3 – of the sub-structure elements SE. A payload field I of variable length (0 through 2^6 bytes) can be defined by the 6 bit long length indicator LI in the cell header, so that a data

transmission with variable transmission bit rate can be realized for the different logical connections.

For a conversion of the packet-oriented data format according to the ATM adaption layer AAL type 2 onto the timeslot-oriented data format according to the TDM method, a TDM channel K0, ..., K3 of the timeslot-oriented data format according to the TDM method is allocated to each element SE of an ATM cell ATM-Z1, ATM-Z2 defined for a transmission of payload data. An allocation of a sub-structure element SE to a TDM channel K0, ..., K3 thereby ensues in a signaling phase preceding the payload transmission. 32 payload channels, which are configured as ISDN-oriented B-channels with a constant transmission bit rate of respectively 64 kbit/s, are generally available for a data transmission in the framework of the timeslot-oriented data format according to the TDM method.

In the framework of the conversion of the packet-oriented data format according to the ATM adaption layer AAL type 2 onto the timeslot-oriented data format according to the TDM method, an adaptation of the – potentially variable – transmission bit rate of the packet-oriented data format deriving due to the size and the arrival of sub-structure elements SE onto the constant transmission bit rate of 64 kbit/s of the timeslot-oriented data format must additionally ensue. This is achieved in the scope of the first operating mode of the conversion unit UE by an insertion of what are referred to as filler cells FZ of variable length into the continuous TDM data stream.

The sub-structure element SE received via the packet-oriented connecting line PO-VL and packed in ATM cells ATM-Z1, ATM-Z2 must be unpacked in the conversion unit UE. For the conversion of the – potentially variable – transmission bit rate deriving due to the size and the arrival of the sub-structure elements SE onto the constant transmission bit rate of 64 kbit/s of the timeslot-oriented data format, what are referred to as filler cells FZ are subsequently attached to the sub-structure elements SE containing the payload data. The length of a filler cell FZ is defined by what is referred to as a filler cell header FZH. the length of a filler cell FZ is thereby

selected such that the overall transmission bit rate of a sub-structure element SE and of a filler cell FZ yields a whole multiple of 64 kbit/s. When the transmission bit rate of a sub-structure element SE is higher than 64 kbit/s – i.e. higher than the transmission bit rate of a TDM channel K1, ..., K4 – the payload data communicated

5 in a sub-structure element SE are divided onto a plurality of TDM channels K1, ..., K4.

In conclusion, these data (sub-structure elements SE and filler cells FX together) are allocated to a TDM channel K0, ... K1 of the timeslot-oriented connecting line ZO-VL declared in the signaling phase and are transmitted via this to

10 the timeslot-oriented switching network module KN.

The signaling information communicated from the conversion unit UE to the control unit STE of the communication system PBX in the framework of the signaling phase are converted in the control unit STE into switching-oriented control data for the timeslot-oriented switching network module KN. A switching of the data

15 (sub-structure elements SE and filler cells FZ together) received via the respective TDM channels K0, ..., K3 of the timeslot-oriented connecting line ZO-VL ensues in the timeslot-oriented switching network module KN on the basis of the switching-oriented control data, i.e. an allocation of a TDM channel of an input line of the timeslot-oriented switching network module KN onto a TDM channel of an output

20 line of the timeslot-oriented switching network module KN.

When the payload data to be communicated are to be transmitted anew via the ATM-based communication network ATM-KN to a receiver, the data (sub-structure elements SE and filler cells FZ together) are transmitted from the timeslot-oriented switching network module KN to the conversion unit UE, wherein the filler

25 cells FZ are removed from the TDM data stream, so that the data stream then only comprises sub-structure elements SE containing payload data. The sub-structure elements SE to be transmitted are packed in ATM cells ATM-Z1, ATM-Z2 in the conversion unit UE and are communicated via the ATM-based communication network ATM-KN to the addressed recipient. When the data are to be transmitted to,

for example, an internal communication terminal device (not shown), then these are transmitted directly to a subscriber line module (not shown) via which the addressed communication terminal device is connected to the communication system PBX.

Figure 3 shows a schematic illustration of a conversion of the packet-oriented ATM data format according to the ATM adaption layer AAL type 2 into the timeslot-oriented data format according to the TDM method (time division multiplex) in a second operating mode of the conversion unit UE.

In contrast to the first operating mode of the conversion unit UE, no separate filler cells FZ are inserted into the continuous TDM data stream in the second operating mode. An adaptation of the – potentially variable – transmission bit rate of the packet-oriented data format to the constant transmission bit rate of 64 kbit/s of the timeslot-oriented data format ensues by filling the sub-structure elements SE with filler data FD, so that the overall transmission bit rate of a sub-structure element SE (payload data and filler data FD together) yields a whole multiple of 64 bit/s. This, however, assumes that each TDM channel K0, ..., K3 additionally has an information about the length of the sub-structure elements SE that is transmitted and supplemented with filler data FD allocated to it such that a separation of the payload data to be transmitted from the filler data FD is enabled with the assistance of this information.

When, proceeding from the first communication terminal device KE-A, data are to be communicated to the second communication terminal device KE-B, the first communication terminal device KE-A sends the necessary signaling information to the communication system PBX in the framework of a signaling phase preceding the payload transmission, sending these information via a defined sub-structure element SE of a first ATM channel V-A, which is frequently abbreviated as VC (virtual channel) in the literature. The transmitted signaling information are unpacked in the conversion unit UE, converted into the HDLC data format and communicated to the control unit STE.

On the basis of the communicated signaling information, a TDM channel – for example, the TDM channel 17 – of the timeslot-oriented connecting line ZO-VL

is allocated to the sub-structure elements Se of the first ATM channel V-A that are defined for the transmission of the payload data from the first communication terminal device KE-A to the communication system PBX. Further, the communicated signaling information are converted into switching-oriented control data for the timeslot-oriented switching network module KN. The switching-oriented control data define which input TDM channel – for example, the TDM channel 17 of the timeslot-oriented connecting line ZO-VL – is connected to which output TDM channel of the timeslot-oriented switching network module KN – for example, the TDM channel 23 of the timeslot-oriented connecting line ZO-VL.

Subsequently, the first communication terminal device KE-A packs payload data to be transmitted into sub-structure elements SE that are in turn packed in ATM cells ATM-Z1, ATM-Z2 and subsequently communicated via the first ATM channel V-A to the communication system PBX. The sub-structure elements SE are unpacked from the ATM cells ATM-Z1, ATM-Z2 in the conversion unit UE. In a next step, the transmission bit rate deriving due to the size and the arrival of the sub-structure elements SE is matched to the constant transmission bit rate of 64 kbit/s by inserting filler cells FZ according to the first operating mode of the conversion unit UE.

The data – composed of sub-structure elements SE and filler cells FZ – are subsequently forwarded via the TDM channel 17 of the timeslot-oriented connecting line ZO-VL to the timeslot-oriented switching network module KN. The data are switched onto the TDM channel 23 of the timeslot-oriented connecting line ZO-VL by the timeslot-oriented switching network module KN and are sent back to the conversion unit UE. The filler cells FZ are removed from the continuous data stream in the conversion unit UE, so that the data stream is not composed only of sub-structure elements SE containing payload data. These sub-structure elements SE are subsequently packed into ATM cells ATM-Z1, ATM-Z2 and transmitted to the second communication terminal device KE-B via a second ATM channel V-B.

Patent Claims

1. Method for switching data that are received via a packet-oriented data transmission link and are to be forwarded, whereby data packets (ATM-Z1, ATM-Z2) subdivided into sub-structure elements (SE) are established for a data transmission via the packet-oriented data transmission link, characterized in that an allocation of the data received via the packet-oriented data transmission link to channels of a timeslot-oriented data format TDM formed of a periodic sequence of channel-individual information segments is undertaken such by a conversion unit (UE) that the data allocated to a sub-structure element (SE) are allocated to at least one channel of the timeslot-oriented data format (TDM); in that a switching of the data converted into the timeslot-oriented data format ensues via a timeslot-oriented switching network module (KN); and in that the timeslot-oriented data are converted back into the packet-oriented data format and are transmitted via the packet-oriented data transmission link.
2. Method according to claim 1, characterized in that a data transmission via the packet-oriented data transmission link ensues according to the ATM data format (asynchronous transfer mode).
3. Method according to one of the preceding claims, characterized in that a sub-structure element (SE) is reserved for the transmission of signaling information allocated to data transmitted via the packet-oriented data transmission link.
4. Method according to claim 3, characterized in that the received signaling information are communicated from the conversion unit (UE) to a control unit (STE) wherein the signaling information are converted into switching-oriented control data for the timeslot-oriented switching network module (KN).

5 6. Method according to one of the claims 1 through 4, characterized in that
filler data (FD) are inserted into a sub-structure element (SE) for an adaptation of the
transmission bit rate deriving due to the arrival and the size of sub-structure elements
(SE) to the transmission bit rate of a channel.

7. Method according to claim 6, characterized in that an information about
10 the plurality of payload data communicated in the channel and an information about
the plurality of filler data (FD) communicated in the channel is transmitted for each
channel.

Fig 1

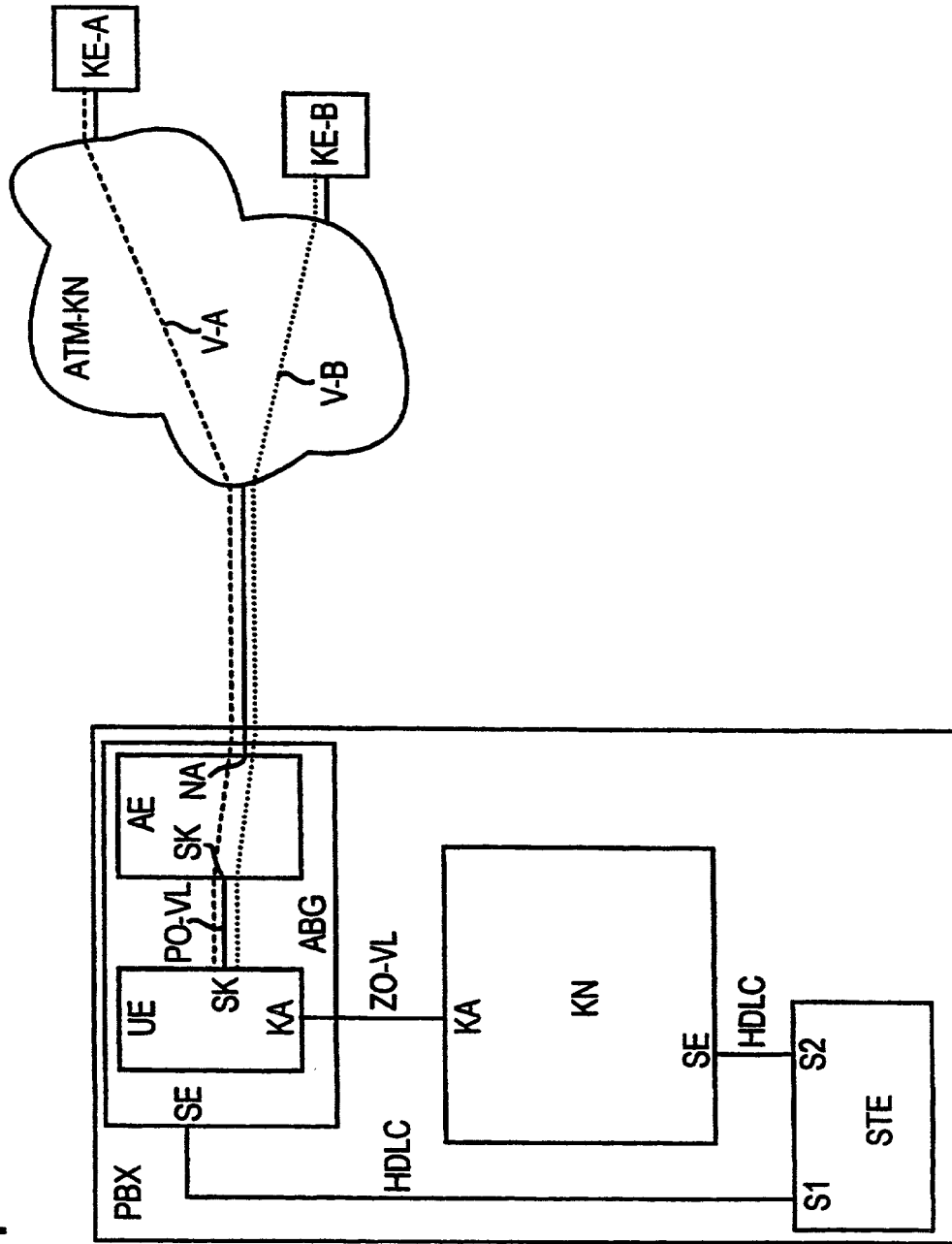
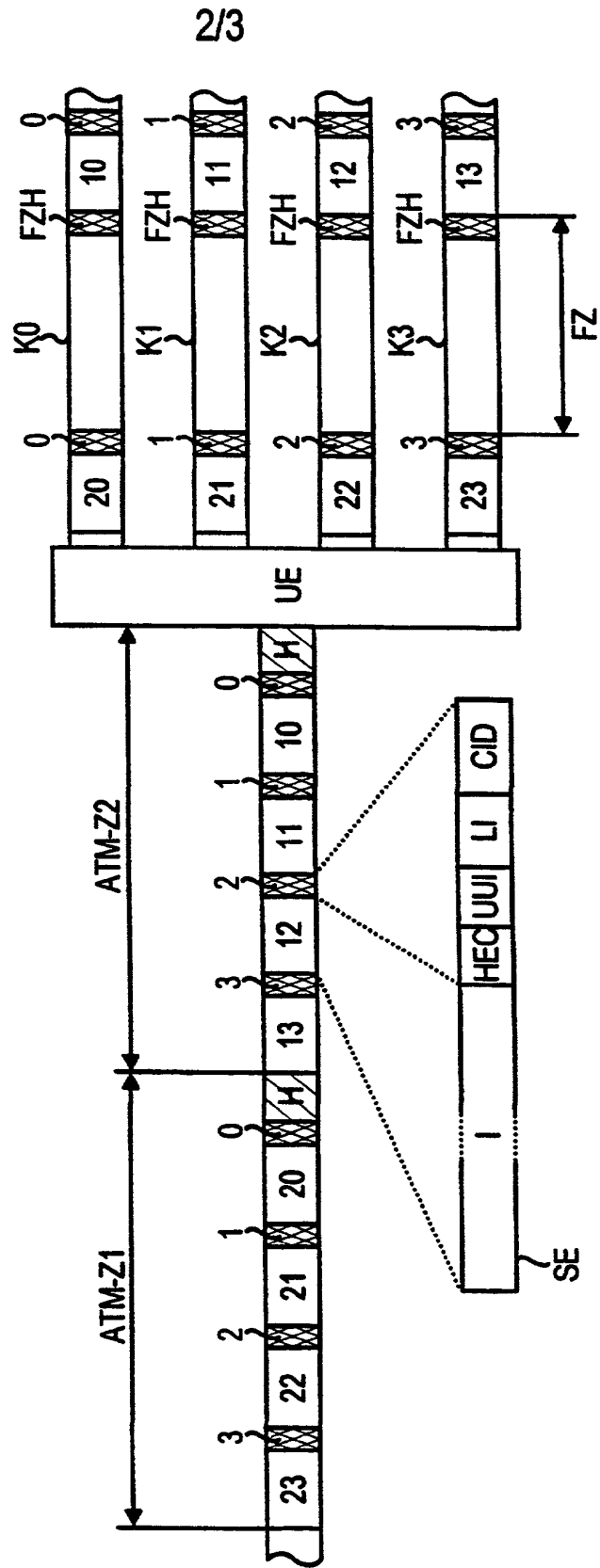
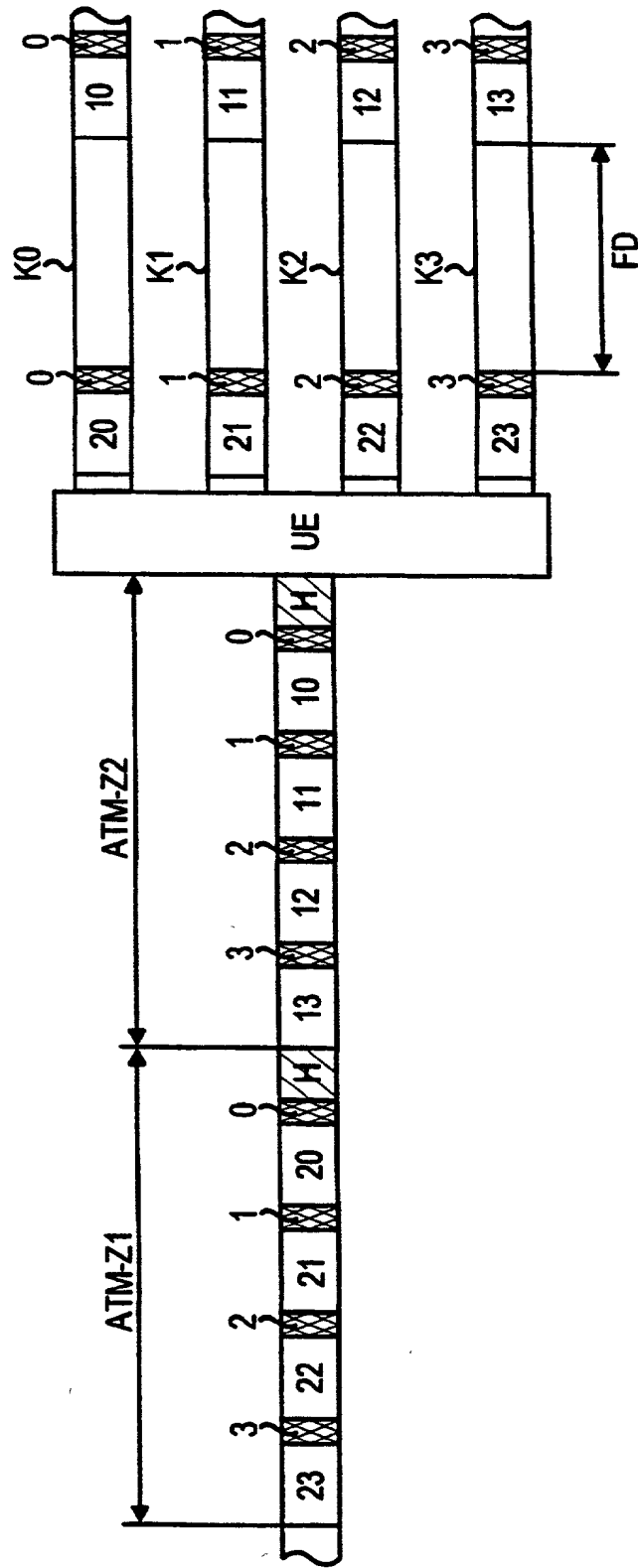


Fig 2



3/3

Fig 3



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[illegible]

Priority Claimed

<input checked="" type="checkbox"/>	<input type="checkbox"/>
Yes	No
Ja	Nein

<input type="checkbox"/>	<input type="checkbox"/>
Yes	No
Ja	Nein

<input type="checkbox"/>	<input type="checkbox"/>
Yes	No
Ja	Nein

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application

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(patented, pending,
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(Status)
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

And I hereby appoint

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APPLICANT(S): KLAUS HÜNLICH ET AL.
ATTORNEY DOCKET NO.: P00,1957
INTERNATIONAL APPLICATION NO: PCT/DE 99/01946
INTERNATIONAL FILING DATE: 01 JULY 1999
INVENTION: METHOD FOR SWITCHING DATA RECEIVED VIA A PACKET-
ORIENTED DATA TRANSMISSION PATH


Assistant Commissioner for Patents,
Washington D.C. 20231

APPOINTMENT OF ASSOCIATE POWER OF ATTORNEY

Dear Sir:

I am an attorney designated on the Power of Attorney for the
above-referenced application. I hereby appoint Mark Bergner
(Reg. No. 45,877) as an associate attorney, with full power of substitution
and revocation, to prosecute this application and to transact all business
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